The Ability of Mangroves to Efficiently Filter Effluent from the Wege Center for Sustainable Fisheries

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Introduction

Aquaculture is the farming of aquatic species such as fish and plants for food. Recently, studies have shown that there is a much higher quantity of nutrients in the water surrounding aquaculture farms (Trot & Alongi, 2000).These can lead to negative effects on the environment such as algae blooms. There have been other problems recorded which are surrounding aquaculture, including genetically modified fish escaping into the wild, and effecting the natural population. (Carpenter, 1998).

The purpose of this project is to test whether or not mangroves (Fig. 1) near CEI are effective enough to deal with waste released from the Labs at CEI. Our hypothesis is that the mangrove system, in which The Wege Center for Sustainable Fisheries releases its effluent, are effective in filtering the excess nutrients.

Fig 1: McKinney creek mangrove system

Fig 2: Collecting samples in McKinney Creek

Methods

Four baseline tests were taken without any sort of fish feed or fish in the facility. Then enough fish feed was put in to sustain 1000 fish at 6 months for 10 days (Fig. 2). In the lab the water samples were tested for dissolved oxygen, temperature, pH, salinity, nitrite, nitrate, phosphate, and ammonia.

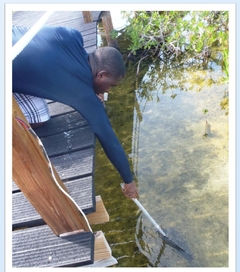

Fig 3: Will taking samples off the bridge

Fig 4: Jack, Will and Emily testing of nutrients in wet lab

Fig 5: Eliott and Brian weighing fish feed to implement in the wet lab drainage system

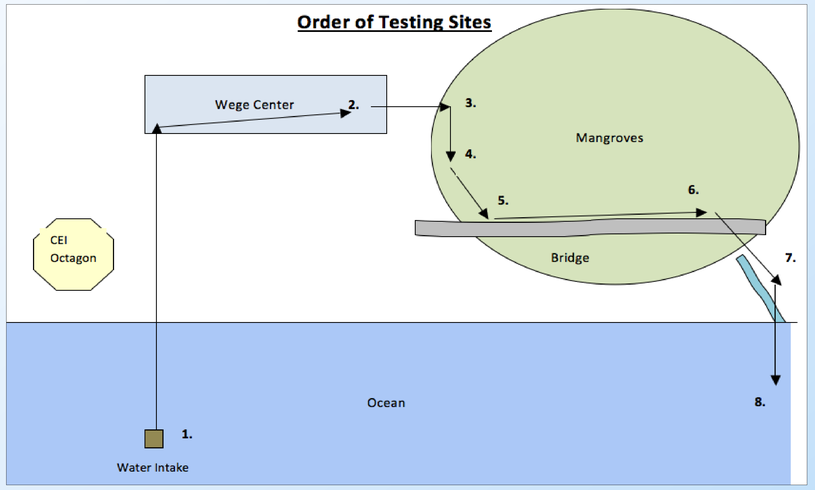

Fig 6: Flow of water through Wege Center and McKinney creek mangrove system numbered in order of testing sites.

Results

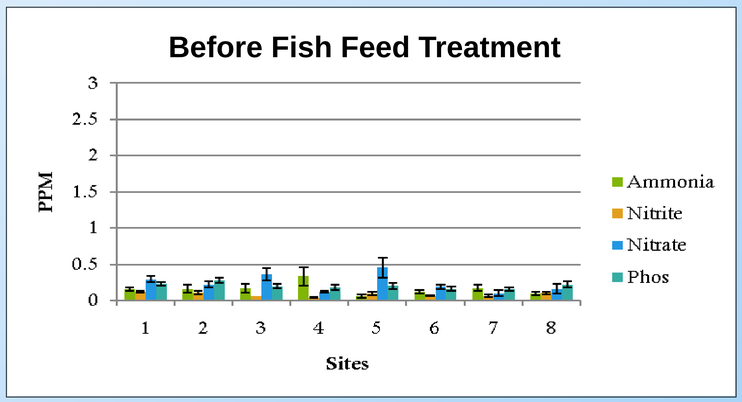

Fig 7: Ammonia, nitrite, nitrate and phosphate levels from sites 1-8 before fish feed was added

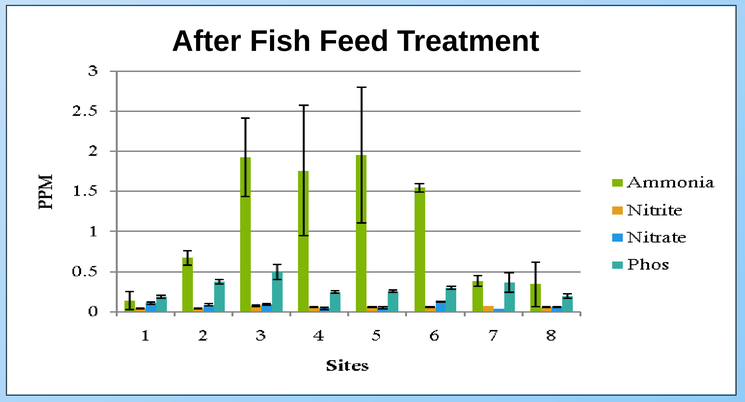

Fig 8: Ammonia, nitrite, nitrate and phosphate levels from sites 1-8 after fish feed was added

Discussion

Conclusion:

Patterns seen in our data prove that our hypothesis is correct because all the levels of nitrite, nitrate, ammonia, and phosphate increased in the wet lab, and decreased throughout the McKinney Creek mangrove system. Ammonia was the only nutrient that showed significant difference after the fish feed was added, and this is because ammonia has to break down into a simpler form before it can be absorbed (Fig. 6). Our findings can promote sustainable aquaculture systems for future aquaculture projects in The Bahamas. Promoting mangroves as a biofilter would help make future aquaculture sites sustainable. Our research extends to past experiments because our study relates to the study from Queensland, Australia where researchers studied the dilution rates of effluents from the aquaculture system (Trot & Alongi, 2000). Future directions for research would be to study and compare more effects of environmental factors on water samples and our overall data. Extended research would help to understand overall effects of the winds, tides and rain on the up-taking process of the mangroves.

Future Research:

Future research could be conducted by studying how the nutrients flow through the mangroves under different environmental conditions, and how these factors affect our overall data. In the future fish could be added to the wet lab. Adding fish into the testing would make it so we could find a maximum level of nutrients and effluents that the mangroves would be able to filter effectively. Having fish would also ensure that the mangroves are fully effective when the wet lab is in full use.

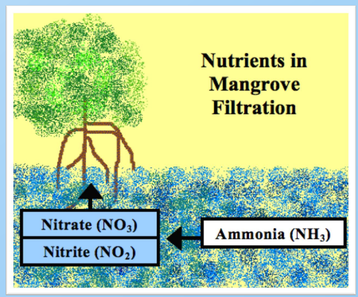

Fig 9: The process of ammonia being broken down and absorbed.

Fig 10: Picture of aquaculture facility in a mangrove system

Works Cited:

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